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AI Based Chatbots for Mental Health Care: A Systematic Review

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Abstract:
Medicinal utilization of Expert systems for psychological resilience maintenance have proficient a accelerated float in the spent a small number of years. AI empowered chatbot shareware and administration have been supervising fundamental therapeutical hospitalization that were beforehand unique feasible from master and skilled medicare executives. Such resources, which orbit from "essential psychologist" to "community cybermens" in mental health, attempt to enhance serving production and cost handling, as well as gathering the mental health needs of unprotected and disadvantaged citizenery. Nevertheless, there is still a substantial gap between recent progress in AI mental health and the widespread use of these solutions by healthcare exponents in therapeutic settings. Furthermore, therapy are recurrently developed without clear ethical proceedings. While AI-enabled solutions show promise in the realm of mental health, further research is needed to address the ethical and communal aspects of these technologies, as well as to establish efficient exploration and therapeutic practices in this fresh sector. Moreover, the current relevant literature still lacks a official and neutral review that specifically focuses on investigation questions from both originators and psychotherapist in AI-enabled chatbot psychologists development. Taking into account all the problems outlined in this study, we conducted a systematic review of AI-enabled chatbots in mental healthcare that could cover some points regarding psychotherapy and artificial intelligence. In this systematic review, we put five research papers related to technologies in chatbot development, psychological disorders that can be treated by using chatbots, types of therapies that are enabled in chatbots, machine learning models and techniques in chatbot psychologists, as well as ethical contests.

Keywords: Chatbots, Conversational factors, Mental health, Mental disorders, Unhappiness.

I. INTRODUCTION

Nowadays the world wide mental health care system is going through demanding times. According to the World Health Organization, one in four people affected by mental diseases at some point in their lives [1]. Mental disorder is still the leading cause of health-associated economic hardship around the world [2]. In particular, depression and anxiety are the most recurrent causes, affecting an estimated 322 million (depression) and 264 million (anxiety) individuals globally [3]. In spite of such growing burden, there seems to be an acute insufficiency of mental health professionals worldwide (9 per 100, 000 people), principally in Southeast Asia (2.5 per 100,000 people) [4]. Despite the fact that there are

efficient and well-known therapies for multiple mental and neourological disorders, only half of people, afflicted by mental disorder, receive them [1]. The main obstacles to successful and wideranging care have been highlighted as a lack of resources and qualified medical experts, as well as social discrimination, stigma and marginalization [1]. Expanding public expectations are raising the bar for healthcare systems to beat the obstacles and offer an accessible, cost-effective, and evidence-based therapy to medically indigent individuals [5].

In light of such situations, information technology tools were hailed as a panacea for fixing long time problems such as societal stigma and a supply and demand conflict in the provision of mental health treatment. It is anticipated that AI-enabled technologies will offer more feasible, affordable, and perhaps less stigmatizing approaches than the traditional mental health treatment paradigm [6]. As a output of the lack of access to mental health treatment, there is an critical need for flexible solutions. Consequently, there has been a surge of interest in advancing mobile applications to complement conventional mental health therapy [7]. Although therapeutic efficacy of these new approaches has been same to traditional methods in studies [8], the regular administration and integration of such computerized mental health support products were shown to be rather less. Poor commitment and acceptance have been linked to the difficulty of technology to adequately engage patients as well as the defeat of clinical trial results to enhance quality of patient care in real-life conditions [9].

The resurgence of computerized mental health treatments is being powered by a renaissance in AI technologies. Conversational factors or Chatbots are AI-enabled software systems that can communicate with users using natural language across a text or voice-based interaction [10]. This technology has been constantly developing and is presently utilized in computerized assistants such as Apples's Siri, Yandex's Alice, Amazon's Alexa and more virtual assistants, as well as consumer interfaces in electronic shopping and online banking [11]. Other applications of the technology include advancement of a new kind of computerized mental health service called mental health chatbots, which has the potential to have a long-term authority on psychotherapy treatment [12]. The automated chatbots can provide evidencebased treatments by simulating social communication in a funny and unprejudiced style, addressing problems including short commitment, inadequate clinician availability, and stigma in mental health care [13].

Number of consumer behavior tendencies has found the urgent need to further our comprehension of artificial intelligence (AI) enabled chatbots in mental health care. Furthermore, textbased chatbots such as Ruhh or Xiaoice have gained popularity by offering secret chats [14], as well as AI-enabled virtual assistants on cellphones and gadgets. Statistical surveys point to an growing willingness among consumers to receive a treatment from conversational factors or chatbots. The number of users who have downloaded mental health chatbots demonstrates the expanding popularity of these self-work technologies.

Despite the increasing scholarly exploration to this concept, numerous studies on AI-enabled chatbot applications contexts are fragmented in terms of psychological or technical experts.

The importance of this problem to the pair psychologists and AI developers, a literature review is essential to integrate previous studies in sequence to obtain an overview of the current state of research, applied technologies, as well as to determine existing challenges, ethical problems and outline potential avenues for time ahead research.

II. MAIN CONCEPTS

Conversational factors or chatbots are software systems that consist of a communicative user interface. They may be classified as open-realm if they can communicate with users about any subject, or task-specific if they help with a particular events. The following are some basic fundamentals in chatbot technology. At first, pattern matching is based on sample stimulus-aknowledgement blocks. Sentences entered by the user serve as stimuli, and answers are created in reaction to those stimuli [15]. ALICE and Eliza were the first chatbots that use computer view. However, a significant drawback of this approach was that the answers were robotic, recurrent, and impersonal. Additionally, it couldn't preserve prior responses, which might outcome in debates repeating [16]. In the 1990s the Artificial Intelligence Markup Language (AIML) was constructed. It is an Extensible Markup Language (XML) based tag-based markup language, which is engaged in natural language modeling for speakers of the stimulus-response conversation system, such as communicative agents. As shown in Fig. 1, AIML is co-ordinated around categories, which are composed of chatbot replies and user input patterns.

```
<aiml version="1.0.1" encoding="UTF-8"?>
  <category>
    <pattern> My name is * and I am * years old </pattern>
    <template> Hello <star/>. I am also <star index="2"/> years old!</template>
  </category>
</aiml>
```

Figure 1: AIML for a chatbot development

Latent Semantic Analysis (LSA) and AIML are widely used to construct chatbots. In the form of a vector illustration, the technology is used to find interconnections among words [17]. LSA is able to react to ignored questions, while AIML may be used to address template-based questions like welcomes and general investigation [18]. It is noteworthy to mention an expert system Chatscript, which is a combination of a difficult programming language engine, in contrast to AIML, and dialog administration system. Rive Script is an another plain text programming language with a line-based syntax for generating chatbots. With Go, Python, Perl, and JavaScript tools, it is at no cost and open-source [19]. Language acceptance relies heavily on Natural Language Processing (NLP), which is used by Google and Apple's Siri. The ability of technology to recognize human natural language textual data and speech-based commands relies on two fundamental origins: natural language understanding (NLU) and natural language generation (NLG) [20]. By observing the final interpretation of the text's true meaning using pragmatic analysis and discourse integration, NLU determines how a particular word or phrase should really be assumed. To produce an intelligible response, NLG uses text realization and text organization. To put it another way, language generation is in charge of forming linguistically reasonable sentences and phrases. Understanding the complexities of actual human language is a major problem for NLP. Language's structure is ambiguous in terms of syntax, lexis, and other speech substances like similes and metaphors. A single word may be gathered as a noun or a verb; a single phrase can be broadcasted in a variety of ways; and a single result can have many interpretations, among other alternatives.

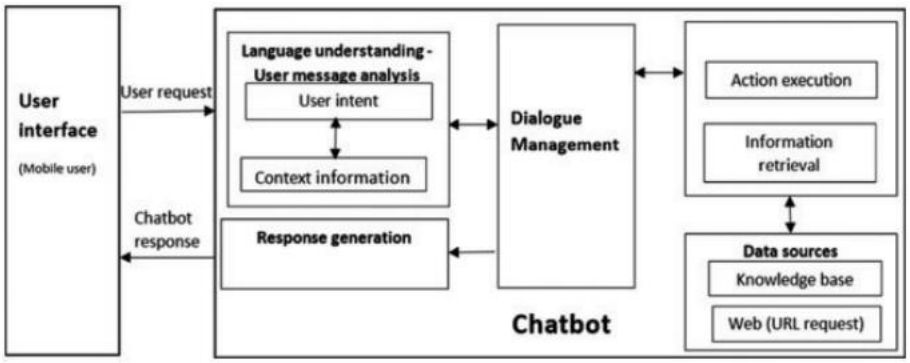

Figure 2: Overall chatbot architecture

III. LITERATURE SURVEY

Sr. no.	Paper title and it's Author	Details of Publication	Finding	Methodology
1.	Casey SackettDevin, Harper Aaron Pavez	26 May 2024	IEEE.org	Likely to involve theoretical analysis or simulation for network optimization or performance evaluation
2.	Batyrkhan Omarov1,*, Sergazi Narynov2and Zhandos ZhumanovCasey SackettDevin HarperAaron Pavez 2	22 September 2022	Researchgate.net	Experimental study with possibly hardware implementation or real-world data analysis
3.	Zoha Khawaja, Jean-Christophe Belisle-pipon.	08 November 2023	frontier.org	Methodology could include algorithm development, comparative analysis, or case studies in AI applications
4.	Mirko Casu 1,2,*ORCID,Sergio Triscari 2,*ORCID,Sebastiano Battiato 1,3ORCID,Luca Guarnera 1ORCID andPasquale Caponnetto 2,3.	5 July 2024	MDPI.com	Likely involves theoretical modeling or simulation to explore new AI techniques or frameworks
5.	Monalisa Das, Sanjeev	Not mentioned	IJCRT.org	Likely includes data

	Kumar Prasad			analysis, case studies, or the development of new business analytics frameworks

IV.DRAWBACKS

1. First paper

- Title: Do We Dare Use Generative AI for Mental Health?
- Author Name: Casey Sackett Devin, Harper Aaron Pavez
- Publisher: ieee.org
- Year of publishing: 26 May 2024
- Drawbacks:

We refer this paper for analysing the chatbot ai finding drawbacks so can find in this if we wil use this chatbot so, chatbot Health had to decide whether generative AI could make chatbot a better tool, or whether the technology was too dangerous to incorporate into our product.

This was well-behaved, refusing to take inappropriate actions like diagnosing or offering medical advice.

2. Second paper

- Title: Artificial Intelligence-Enabled Chatbots in Mental Health.
- Author Name: Batyrkhan Omarov1,*, Sergazi Narynov2and Zhandos ZhumanovCasey SackettDevin HarperAaron Pavez 2
- Publisher: Researchgate.net
- Year of publishing: 22 September 2022
- Drawbacks:

1. Lack of Concrete Examples or Data: it lacks specific examples or supporting data from studies or real-world cases to strengthen its claims.
2. Overgeneralization: The statement suggests that all consumers interact with chatbots the same way they do with humans, which may not apply universally. Some individuals may still prefer human interaction or find chatbots impersonal.
3. Repetitive Language: The paragraph mentions "conversations with chatbots and humans" and "individuals psychologically interact with chatbots" in similar ways, creating redundancy without expanding on the comparison.

3. Third paper

- Title: Your robot therapist is not your therapist
- Author Name: Zoha Khawaja, Jean-Christophe Belisle- pipon.
- Publisher: frontier.org
- Year of publishing: 08 November 2023
- Drawbacks:

1. Unclear Explanation of "TM": The term "TM" is introduced without any explanation or definition, making it unclear to readers unfamiliar with the concept. This weakens the argument because critical

terms should be defined clearly, especially in specialized fields like mental health care.

2. Lack of Supporting Evidence: The paragraph introduces several concepts but lacks empirical support, such as studies or data that back up the claims made about biases, digital therapeutic alliances, or patient misconceptions. This weakens the overall argument, making it feel more speculative than evidence-based.
3. Assumed Misconceptions: The assumption that patients have misconceptions due to advertising or design biases is made without considering that some users may have valid concerns or skepticism about the efficiency of AI chatbots in mental health care.

4. Fourth paper

- Title: AI Chatbots for Mental Health
- Author Name: Mirko Casu 1,2,*ORCID,Sergio Triscari 2,*ORCID,Sebastiano Battiato 1,3ORCID,Luca Guarnera 1ORCID andPasquale Caponnetto 2,3.
- Publisher: MDPI.com
- Year of publishing: 5 July 2024
- Drawbacks:

1. Lack of Depth on Mental Health Application: While the paragraph highlights the technical aspects of AI chatbots, it does not delve into how these specific technologies (ML, DL, NLP) improve mental health interventions. There is limited focus on practical applications or case studies in mental health, making the relevance to the topic less clear.
2. Lack of Evidence or Studies: The paragraph refers to several numbered citations (e.g., [29,30]), but no actual studies or empirical evidence are presented to support the claims about AI chatbot effectiveness. Including specific research findings or examples of successful.
3. Generalization of Use Cases: The mention of using chatbots to "collect patient data and provide health education" is vague and lacks specificity regarding mental health. Mental health chatbots may perform tasks like symptom tracking, providing cognitive behavioral therapy (CBT), or crisis intervention. These specific use cases should be mentioned to tie the discussion directly to mental health care.

5. Fifth paper

- Title: A Chatbot System For Mental Health Care
- Author Name: Monalisa Das, Sanjeev Kumar Prasad
- Publisher: IJCRT.org
- Year of publishing: Not mentioned
- Drawbacks:

1. Lack of Clarity: The sentence "The different conversational agents currently available in the field of psychiatry and their role in treating, analysing and diagnosis of mental illness" is incomplete and lacks clarity. It doesn't form a complete thought or provide specific details about the conversational agents and their functions.
2. No Mention of Limitations: The paragraph only emphasizes the positive aspects of chatbots in mental health, without addressing any limitations or potential downsides, such as lack of human empathy, data privacy concerns, or the inability to handle complex mental health issues. A more balanced perspective would be valuable.

V. DISCUSSION

It's essential to note that customers saw medical chatbots as having many as benefits, and even

anonymity, ease, and quicker access to pertinent details. This supports the suggestion of previous research that consumers are just as willing to allocate emotional and factual data with a chatbot as if they were with a human mate. Conversations with chatbots and humans had comparable levels of perceived comprehension, disclosure closeness, and cognitive reappraisal, recommended that individuals psychologically interact with chatbots in the same way they do with persons. A few representatives in mental health settings specified the apparent anonymity, but the preferences for certain chatbot usage in healthcare contexts need to be inspected further. Our outputs back up the qualitative research findings that investigated chatbot user expectations in terms of comprehension and preferences. Users are usually unsure what chatbots can achieve, but they believe that this technology will enhance their experience by giving instant access to relevant and useful details. They also recognize the chatbot's lack of determination as a unique feature, but it was formerly pointed out that establishing bond with a chatbot would require belief and meaningful interactions. These reasons for using chatbots need to be thoroughly checked further in order to determine how this technology may be securely consolidated into healthcare.

VI. CONCLUSION

Patient motivation and engagement must be appropriate thoroughly evaluated in order to optimize the advantages of AI technologies as their utilizing in treatment of psychological disorders becomes more ubiquitous. Although many individuals have open access to medical conversational factors, the majority of concerned people is still hesitant to resort to the appearance of AI-enabled evaluations, according to our research. Therefore, intervention engineers should utilize theory-based techniques in order to tackle user varieties as well as to provide efficient and formal services suitable of narrowing the healthcare and well-being gap. Future studies are needed to determine how clinical chatbots might be expertly employed in healthcare and preventative medicine, especially by enabling living souls to take a more active role in therapy of their own health problems.

The main topics of this review are the definition of technologies for the advancement of chatbots for mental health, identifying mental issues that can be solved using chatbot applications, as well as the explanation of artificial intelligence methods for chatbot applications and the definition of ethical problems in the advancement of chatbot applications for mental health.

The target audience for the psychological health software has been determined as an underserved and exposed part of the population that critically needs medical support. Accordingly, the creators of these apps should take inconsistent details and a lack of data attentively. It is critically important that users should be informed if an app was established as part of an experiment that will end after a certain amount of time or has already been ended.

The demands of unprotected and underserving populations should be finer understood by designers from the viewpoints of the pair end-users and experts. These insights go beyond the actual mental health issues to added questions such as how people who need mental health support can use these programs to get advantages, when and why they should end using them, and what it implies for their wellness. Application originators shouldn't generalize "unknown detrimental impact for a single state" as a wholly null effect because "not known unfavorable impact for a single circumstance" may not be suitable or proven for digital behavior.

Like conventional learning techniques, each individual has their own preferable learning manner while using virtual applications. Two main benefits of employing a digital instrument are the ability to

quantify and adjust for variation of expertise approaches. In each unique case, there is still a lot to learn about computerized learning techniques. While patients' individual mental health condition further complicates the variety in learning methods, AI-based personalization is considered to be the main idea in the psychological health app market. The extent of personalization is a further problem brought up in this research. A framework for assessing mental health programs should contain metrics to gauge features like customization—how personalized the app is, how relevant it is to the patient's state, and how this personalization affects the state being targeted as well as the patient's general wellbeing.

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Conflicts of Interest:
The authors assert that they have no conflicts of concern to report regarding the ongoing study.